

**SCATTERING-RETICLE ASSEMBLIES FOR ELECTRON-BEAM**  
**MICROLITHOGRAPHY INCLUDING A SCATTERING-STENCIL**  
**RETICLE PORTION AND A SCATTERING-MEMBRANE RETICLE**  
**PORTION**

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**Abstract**

Disclosed are reticle assemblies for use in electron-beam microlithography. An exemplary reticle assembly includes a scattering-stencil reticle portion and a scattering-membrane reticle portion that define respective portions of the overall pattern defined by the reticle assembly. The reticle portions desirably are mounted to a reticle frame to provide strength and rigidity to the assembly. By combining both types of reticles in a single reticle assembly, the shortcomings of each are minimized compared to a single reticle type by which the entire pattern is defined. Because fabrication processes for the two reticle types are different, the reticle types can be fabricated separately and then bonded to the reticle frame to form the reticle assembly. Also disclosed are electron-beam microlithography apparatus and methods that include use of such reticle assemblies. Compared to conventional reticle assemblies as well as conventional apparatus and methods using them, reticle assemblies as disclosed herein can reduce the need to stitch together complementary pattern portions and reduce chromatic aberrations.